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PROPOSAL: [REDACTED]
17 August 1956

STATEMENT OF WORK
STUDY AND DESIGN OF RETROFIT MODIFICATION OF
SYSTEM 1 AND 3 RECORDER UNIT

Information received from Project Headquarters personnel and from contractor technical representatives indicates considerable variability in performance of the recorder associated with Systems 1 and 3. It has been observed on occasion that the tape speed has been as low as 70% of its rated value throughout a substantial portion of a mission, and that all attempts to correct this situation by careful cleaning and mechanical alignment of recorder elements have failed to result in proper performance. It has been noted also that in the event of failure of the aircraft 28-volt power source, tape continues to be driven through the recorder because of the energy stored in the filter mechanism associated with the drive capstan. Such action causes the tape to deviate from its normal guided path to the extent that reactivation of the recorder results in improper tape transport and consequent jamming of the recorder mechanism.

The causes of erratic variations in tape speed are not apparent immediately, inasmuch as a prototype recorder was checked for satisfactory operation under low temperature conditions and found to perform in a satisfactory manner. The environmental conditions prevailing during this test were different, however, from those encountered in normal airborne usage, and information received from the field suggests that the tests performed at an earlier date were inadequate. The contractor recommends, therefore, that a comparatively brief but intensive program of investigation into the causes of the difficulties being experienced be authorized, the objectives of this program being those of determining the basic causes of the difficulties encountered and the development of means for eliminating these difficulties. While it is probable that no single factor accounts for improper performance of the recorder, it is equally probable that temperature effects are predominate and, to the extent that this may prove to be true, resort to the use of electrically heated covers for recorder units may prove necessary.

Overrunning of tape after removal of the primary power supply to the recorder can be eliminated by the use of a magnetically actuated jam-roller mechanism for maintaining contact between the tape and the capstan during normal recorder operation. This mechanism would open automatically at the instant of power failure, thereby permitting the tape to be brought to an immediate stop regardless of the time

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required for the capstan to come to a stop. The principal difficulties anticipated in incorporating such a mechanism result from the extremely limited amount of space available for mounting this unit.

The contractor submits this proposal to cover such study and development work and the provision of all engineering, labor, supplies and materials necessary to determine the cause of unsatisfactory recorder performance and the modifications to the recorder design necessary to overcome the difficulties which have been experienced in field operations. The work proposed will include, but not necessarily be restricted to the following:

1. An experimental investigation at normal and sub-normal temperatures to determine the reasons for erratic behavior of the tape-driving mechanism, with the objective of determining which, if any, of the recorder elements require redesign to permit satisfactory low-temperature operation, and further to permit a determination of the low temperature limits for satisfactory recorder performance. This study will include an investigation of the influence of low temperatures upon bearing and lubricant behavior, and of such mechanical distortions as might result in the generation of increased tape-driving power requirements. This study will be directed to reveal also the effect of low operating temperatures upon reel alignment and tape wrapping on the take-up reel.
2. Design of a magnetic-solenoid actuator for the jam-roller mechanism, the purpose of the actuator being that of ensuring adequate pressure between the jam-roller and the capstan during normal recorder operation and of providing means for rapid disengagement between tape and capstan in the event of primary power failure.
3. Design of an electrically-heated cover for the recorder to permit satisfactory recorder operation at lower temperatures than is now possible.
4. Investigate the desirability and effect of substituting steel for the aluminum alloy now employed in fabrication of the capstan frame member to minimize the

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difficulties resulting from differential thermal effects in the capstan supporting structure.

5. Investigation of the properties of lubricants which might be utilized on the several moving elements of the recorder to permit selection of a lubricant providing improved characteristics at very low temperatures over those of the lubricant now employed.

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